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7	<input type="checkbox"/>	<input type="checkbox"/>	US 6237786 B1	20010529	316	Systems and methods for secure transaction	213/153	380/203; 705/51;		Gint
8	<input type="checkbox"/>	<input type="checkbox"/>	US 5982891 A	19991109	315	Systems and methods for secure transaction	705/54	705/26; 713/167		Gint
9	<input type="checkbox"/>	<input type="checkbox"/>	US 5949876 A	19990907	320	Systems and methods for secure transaction	705/80	705/1; 705/39;		Gint
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48

☒ **Judith Cushman 2-hour career development seminar.**  
Start Date: 10/15/2003 1:30:00 PM  
End Time: 10/15/2003 3:30:00 PM  
Event Type: Special - one price





47

☒ **What is the pulse of the market and how do PR Professionals plan for the future?**  
Start Date: 10/15/2003 11:30:00 AM  
End Time: 10/15/2003 1:30:00 PM  
Event Type: Monthly Meeting





46

☒ **Gus Whitcomb  
Acting Managing Director  
Corporate Communications  
American Airlines**  
Start Date: 3/17/2004 11:30:00 AM  
End Time: 3/17/2004 1:30:00 PM  
Event Type: Monthly Meeting





45

☒ **Priscilla McLane Plumb**  
Start Date: 2/18/2004 11:30:00 AM  
End Time: 2/18/2004 2:30:00 PM  
Event Type: Monthly Luncheons





44

☒ **Terri Saylor  
Amerman Experience**  
Start Date: 1/21/2004 11:30:00 AM  
End Time: 1/21/2004 1:30:00 PM  
Event Type: Monthly Luncheons





43

☒ **Dan Alvarez  
Nordstrom  
General Manager**  
Start Date: 12/17/2003 11:30:00 AM  
End Time: 12/17/2003 1:30:00 PM  
Event Type: Monthly Luncheons






42






☒ **Diversity and Women  
Marketing to Various Groups.**  
Start Date: 11/19/2003 11:30:00 AM  
End Time: 11/19/2003 1:30:00 PM  
Event Type: Monthly Luncheons






   






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11/20/03






40  [The Real World: PR](#)      
Start Date: 9/13/2003 9:00:00 AM  
End Time: 9/13/2003 2:00:00 PM  
Event Type: Conferences






39  [Lunch Only - Media Day](#)      
Start Date: 9/24/2003  
End Time: 9/24/2003 1:30:00 PM  
Event Type: Media Day

38  [Half Day - Media Day](#)      
Start Date: 9/24/2003 7:30:00 AM  
End Time: 9/24/2003 5:30:00 PM  
Event Type: Media Day






37  [Full Day - Media Day](#)      
Start Date: 9/24/2003 7:30:00 AM  
End Time: 9/24/2003 4:45:00 PM  
Event Type: Media Day


36  [PRSA Luncheon August 20: Beyond Terror: Crisis Communications Now With Brig. Gen. Ronald T. Rand](#)      
Start Date: 8/20/2003 11:30:00 AM  
End Time: 8/20/2003 1:30:00 PM  
Event Type: Monthly Luncheons

33  [July Luncheon: Michael Garfield](#)      
Start Date: 7/16/2003 11:30:00 AM  
End Time: 7/16/2003 1:30:00 PM  
Event Type: Monthly Luncheons

32  [Where Responsibility Falls: A Public Relations Perspective of What Happened At Enron](#)      
Start Date: 6/18/2003 11:30:00 AM  
End Time: 6/18/2003 1:30:00 PM  
Event Type: Monthly Luncheons

31  [Going on the Record: Former White House Media Insider Talks About the President, the Press and the Message](#)      
Start Date: 5/21/2003 11:30:00 AM  
End Time: 5/21/2003 2:30:00 PM  
Event Type: Monthly Luncheons

29  [2003 Big League Excalibur Awards](#)      
Start Date: 6/25/2003 5:00:00 PM  
End Time: 6/25/2003 10:00:00 PM  
Event Type: Monthly Luncheons

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... The schema is inspired by the recurrence rules used in the iCalendar [24] specification. ...

[2] J. Kaufman, J. Ruvolo, and D. Ford, **Tempus Fugit** and the Need for ...[www2002.org/CDROM/refereed/107/](http://www2002.org/CDROM/refereed/107/) - 96k - [Cached](#) - [Similar pages](#)**[PDF] The Social Contract Core**

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# Tempus Fugit: A system for making semantic connections

Daniel A. Ford, Joann Ruvolo, Stefan Edlund, Jussi Myllymaki, James Kaufman,  
Jared Jackson, Martin Gerlach

IBM Almaden Research Center, 650 Harry Road, San Jose, CA, 95120-6099, USA, +1 (408) 927-2203  
{daford, ruvolo, edlund, jussi, kaufman}@almaden.ibm.com, {jjared, mgerlac}@us.ibm.com

## ABSTRACT

Tempus Fugit ("Time Flies") is the first of a new generation of *Personal Information Management* (PIM) systems. A PIM system incorporates an electronic calendar, "to-do" list and address book. The premise behind Tempus Fugit is that information stored in electronic calendars, to-do lists and address books can be given richer semantic interpretation and automatically processed to make its users more effective. Tempus Fugit also tracks the physical and virtual locations of users and uses this information to predict meeting attendance and help them as they travel during their day.

## Categories and Subject Descriptors

H.3.3 [Information Storage and Retrieval]: Information Search and Retrieval — *Information filtering*, H.3.4 [Information Storage and Retrieval]: Systems and Software — *User profiles and alert services*, H.4.1 [Information Systems Applications]: Office Automation — *Time Management*, H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces

## General Terms

Management, Design, Experimentation, Human Factors

## Keywords

Electronic Calendar, Active Calendar, Electronic Address Book, Personal Information Management, PIM, Location Based Services, Location tracking, Mobile Productivity, Software Agents

## 1. INTRODUCTION

Electronic *Personal Information Management* (PIM) systems store and manage calendar, "to-do" and address book information. These systems record where a person is planning to go, whom they will meet, and why. They record the tasks a person wishes to accomplish, and they record whom they know. These details constitute a precise and detailed picture of a person and their activities - the kind of details that could be used to direct automated processes that work on their behalf.

Conventional PIM systems are static "databases" providing reliable, but basic, storage and display capabilities of the information they manage. These systems make no semantic

interpretations of the data they store. A person's regular dentist appointment is managed in exactly the same way as an important job interview.

This paper describes a new kind of PIM system, one we call *Tempus Fugit* ("Time Flies"). This system is an *active* PIM system. It provides conventional calendar, to-do and address book functionality, and then extends that functionality by making semantic interpretations of the entries it manages. It uses those interpretations to trigger processing of PIM entries to provide enhanced value to its users. For instance, for a person scheduled for a job interview, the system will automatically gather background information on the company and person hosting the interview. Further, address book entries in Tempus Fugit include more relationship information (e.g., "this is my mother") and personal attributes (e.g., "this person likes opera") than conventional systems. Tempus Fugit offers other features that conventional systems do not. In particular, Tempus Fugit incorporates the ability to track the physical and virtual locations of people and objects. So, not only does the system know that a person is scheduled to be at a meeting, it can predict if they will be late, and when they will likely arrive.

In this paper, we will describe in detail the architecture of Tempus Fugit and its implementation and discuss our experiences as experimental subjects and users of the system.

## 2. TEMPUS FUGIT

Tempus Fugit is a fully functional Personal Information Management system. It allows users to schedule appointments, create "shared calendars", enter and prioritize to-do items and add users to their address book. It implements the iCalendar protocol and can seamlessly interoperate with other calendar systems. It can be accessed using a conventional web-browser (Figure 1) or with a mobile phone that supports WML and WAP. The implementation currently sports a look-and-feel (Figure 1) we call "Mozongo".

### 2.1 The Tempus Fugit Electronic Calendar

The Tempus Fugit electronic calendar differs from a conventional electronic calendar system in that it associates a semantic interpretation of each entry it stores. This interpretation is used to automatically complete some form of *personal event preparation*. Ideally, the results of this preparation will mimic or be better than those produced by a human manually preparing for the event. The advantage of Tempus Fugit is that it will do the preparation for each and every event, a service currently enjoyed by only the highest-level executives of large corporations. The Tempus Fugit calendar also leverages the system's ability to track people and objects to coordinate their interaction in time (calendar) and space (location). The combination creates a "smart" active calendar that attempts to prepare its users for their events before they happen, and then monitors their physical relationship to the event (i.e., Are

they late?) For business meetings, the system will automatically generate a background summary for all companies involved in the meeting. This summary includes a brief (5-10 sentence) summary of the company and its business, its address and phone numbers, the names of the company officers, as well as an up-to-date list of news headlines (with links to the article body) regarding the company. This list is updated frequently until after the event completes. Similarly, the system will automatically gather background information for all participants of a meeting, for instance, any patents or publications or news.

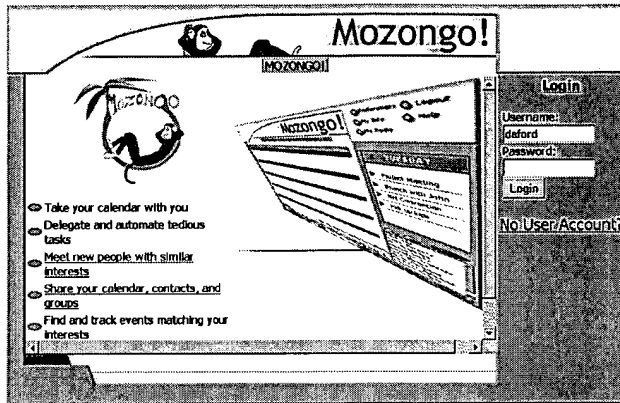


Figure 1 Tempus Fugit login web page with "Mozongo" look-and-feel

The meeting attendance prediction features of Tempus Fugit attempt to determine if and when a participant in a meeting will attend. It uses the current physical location (latitude and longitude) of a participant and the physical location of the meeting (latitude and longitude of a building or place) to compute their current distance from the meeting. Successive samples of their position are used to compute velocity and then derive an estimated time for their arrival. The presence of conflicting events for participants is also noted in the attendance prediction. Below, in Figure 2, is a close-up of the format used by Tempus Fugit to display meeting attendance prediction.

The display uses a "progress bar" to represent the duration of the meeting and similar bars for each participant showing the predicted overlap of their attendance with the duration of the meeting time. The first participant ("Stefan Edlund") is shown to be "En Route", but likely to be about 10 minutes late. This is an actual prediction generated from the then current position of his vehicle as reported by a GPS transponder (see section 3).

## 2.2 The Tempus Fugit To-Do List

In addition to standard to-do list functionality, Tempus Fugit supports hierarchies of to-dos. For example, a to-do to organize a conference would include other to-dos to prepare an agenda, schedule speakers, and organize refreshments.

## 2.3 The Tempus Fugit Address Book

As in a conventional address book, Tempus Fugit allows users to maintain information on a collection of people, including their name and contact information. Additionally, the Tempus Fugit address book maintains relationship information (e.g., friend, best friend, co-worker, mother) used to aid in event planning.

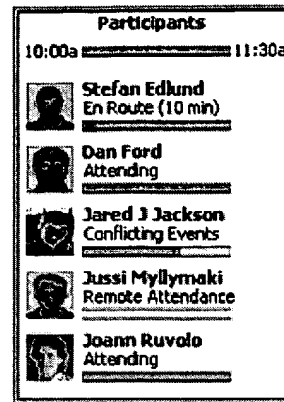


Figure 2 Close up of meeting attendance prediction display

Within Tempus Fugit, the address book provides an *at a glance* status display. At any point in time users may view the status of their friends, colleagues, or any other designated group. Users may discover, assuming they have access, the location and current availability (e.g., from calendar events) of the members of their chosen group, as shown in Figure 3.

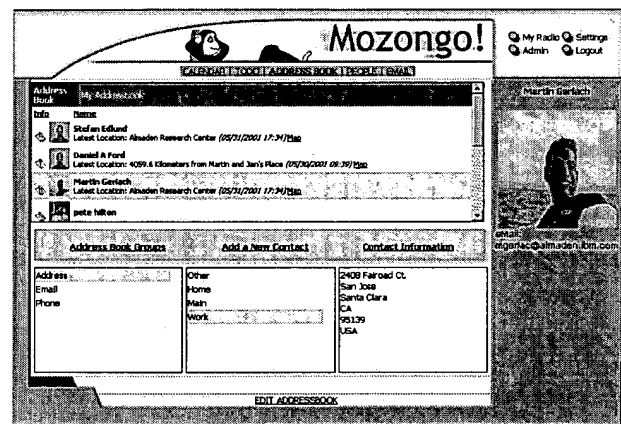


Figure 3 Address book with integrated location tracking status

## 2.4 Social Connectivity

An important feature of Tempus Fugit is enabling the discovery of potential social connections between people. For instance, when a new person joins an organization like a company or a university, they are usually completely unaware of the traits and characteristics of the other individuals in the organization and have few resources other than serendipity to discover compatible people. Tempus Fugit uses its intimate knowledge of all of the individual people it is partnered with to form a larger aggregated view of the organization. This view can then be processed or searched to locate compatible (or incompatible) people.

Tempus Fugit supports the identification of compatible people through an automatically maintained taxonomy of its entire user base that can be browsed in a manner similar to Web-based taxonomies (e.g., Yahoo), except that instead of locating web pages, users find groups of people. Users can find people who are "like" themselves. The definition of "like" or "not like", is an interesting research problem that we are aggressively pursuing.

### 3. LOCATION TRACKING

An innovative feature of Tempus Fugit is the support it provides for tracking the location of people and objects. Location tracking data is provided by a network service that supports a variety of location tracking technologies and sources. Vehicles belonging to users are equipped with GPS location transponders which provide accurate latitude and longitude information. The positions of *Research In Motion* (RIM) *Blackberry* two-way pager/PDAs are also tracked (either "tower id" or Lat/Long from an interface with a NMEA-compatible GPS receiver). In an office environment, the location service tracks the location of laptop and desktop computers by combining information from a wireless Ethernet network and keyboard activity tracking software installed on the computers being tracked.

### 4. SYSTEM IMPLEMENTATION AND ARCHITECTURE

Tempus Fugit is implemented entirely in Java™ and runs on both Windows 2000 and Linux. The core components are implemented as Java™ Servlets and Enterprise Java Beans (EJBs) and run within IBM's WebSphere Application Server (V3.5). IBM's DB2 UDB relational database (V6.1) serves as the system's persistent storage. A diagram of the system architecture of Tempus Fugit is shown in Figure 4.

The advanced features of Tempus Fugit (e.g., background intelligence gathering, location tracking, etc.) are implemented as external *network services*. These services are accessed using the *Simple Object Access Protocol* (SOAP). This design makes Tempus Fugit extremely flexible and easy to extend by adding new services. We currently have implementations of background intelligence, location tracking, weather reports and "Web Site" extraction services.

A great deal of care was taken in the design of the system to decouple the interface (e.g., "Mozongo") from the implementation. To accomplish this, the interfaces are completely defined by a set of "style sheets" defined using XSLT. Depending upon the target interface, the output markup language from Tempus Fugit is transformed using an appropriate style sheet. Tempus Fugit generates HTML, WML and VoiceXML™, simply by providing three different XSL style sheets. Full support for national languages and localization is designed into the core of Tempus Fugit. Currently, the system supports US and Canadian English, Swedish, German, Finnish and Spanish.

### 5. PRIVACY

Access controls are critical in a system like Tempus Fugit which has knowledge of the intimate details of its users lives (e.g., activities, plans, goals, relationships, location). While access controls can be used to effectively restrict access to personal data, we felt it necessary to also ensure the privacy of our users. To this end we have defined an *e-Social Contract* [2], the foundation of the design philosophy behind Tempus Fugit, and that, which should be considered in the development of any agent technology.

### 6. CONCLUSION AND FUTURE WORK

Tempus Fugit is a system that partners with its users and uses intimate knowledge of their lives gathered through an electronic

personal information management (PIM) system to automate personal and social aspects of their lives. The system includes the ability to track the physical location of users and combine that information with that gathered from their PIM and other sources to provide them with features keyed off of their current location.

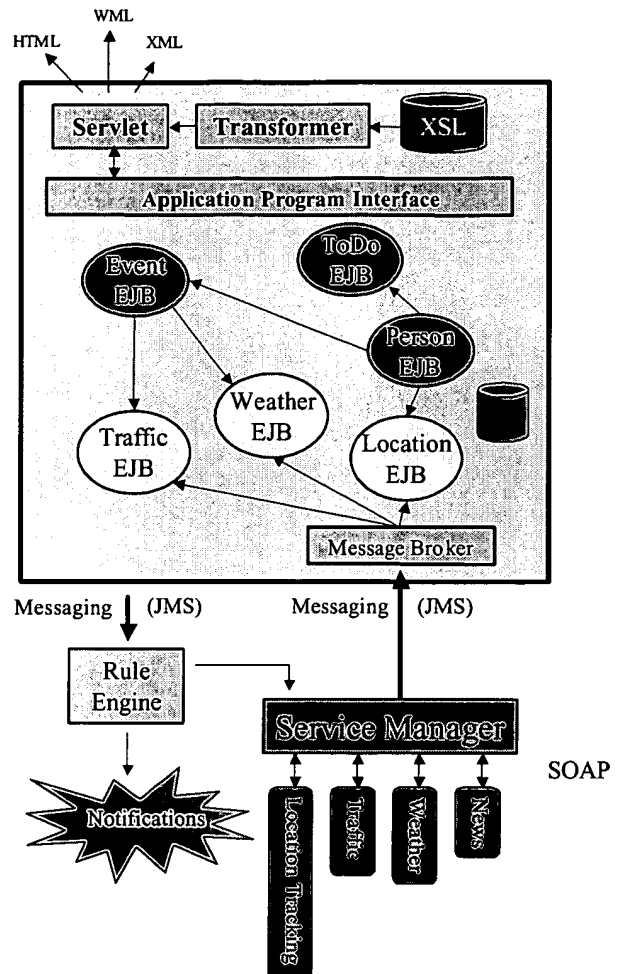


Figure 4 Tempus Fugit Architecture

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# Personal Automation: Combining Personal Information Management Systems and Rule Engines.

Stefan Edlund  
IBM Research  
650 Harry Rd.  
San Jose, CA 95120  
+1 408 927 1766  
edlund@almaden.ibm.com

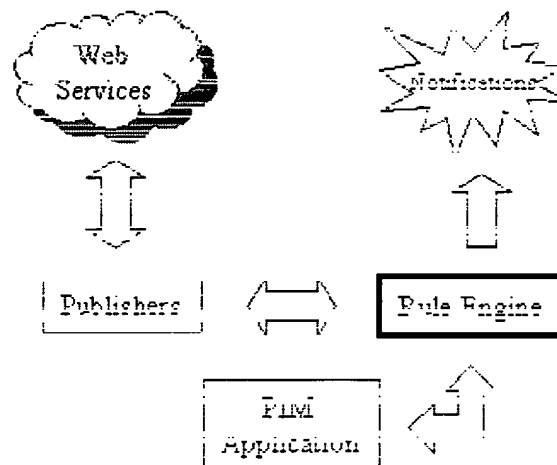


Figure 1. Architecture overview

## ABSTRACT

By the use of declarative rules, automation of tasks can be performed through an electronic personal information management (PIM) application. Rules can be used in a variety of different scenarios, for instance to trigger information retrieval tasks or to send out notifications when a pre-determined set of conditions are satisfied. The technology described is an integral part of the IBM Tempus Fugit [1] research project.

## Keywords

PIM, Rule Engines, Java, XML, Messaging, Information Retrieval, AI

## 1. INTRODUCTION

Several technologies have made it possible for personal information management applications to become "smarter". First of all, emerging groupware standards simplifies access to PIM data on heterogeneous systems, enabling effective exchange of schedules, address books, todo items etc. Secondly, "intelligent" PIM applications can utilize emerging services infrastructures [2] to associate active, context sensitive information such as flight schedules or weather forecasts with scheduled activities.

However, applications that are able to provide the "right information at the right time" and perform automated tasks on behalf of users need to be guided by a specific set of rules. A forward chaining inference rule engine provides a solution that can be used in a variety of different circumstances.

## 2. ARCHITECTURE AND IMPLEMENTATION

```
<WeatherAlertRule> WeatherAlert(?X, ?Y) <-  
  Event_LOCATION(?X, ?LOC)  
  AND Event_DTSTART(?X, ?START)  
  AND Event_CLIENT(?X, ?Y)  
  AND Weather_LOCATION(?W, ?LOC)  
  AND Weather_DATE(?W, ?START)  
  AND Weather_CHANCE_OF_RAIN(?W, ?PERCENT)  
  AND Preference_RAIN_THRESHOLD(?Y, ?P)  
  AND greaterThan(?PERCENT, ?P).
```

#### Listing 1. Weather alert rule for travel events.

Figure 1 shows an architecture overview. Information entered into a PIM application is forwarded to a rule engine, which transforms the information into knowledge (facts). Publishers provide the next step in the chain by periodically querying services on the Web for relevant context sensitive information, incorporating the results into the rule engine knowledge base. Configuration of the publishers is dynamically handled by rules triggering on various application events, such as the scheduling of a new meeting in a calendar. By attaching procedures to the derived conclusions (also called *effectors*, see [3]), tasks can dynamically be performed.

Listing 1 shows an example of how a Weather alert rule is described using Courteous Logic Programs (CLP) [3]. The rule fires if the chance of rain at the destination for a scheduled travel event is higher than user-specified threshold. If a "send-email?procedure is attached to the rule, users will automatically be notified whenever bad weather is forecasted. Facts are represented using an identifier for the type of object described, followed by '.\_?' and the name of a particular attribute. For example, `?i>Event_DTSTART?` indicates the start date of a scheduled calendar event. Attributes associated with calendar PIM objects comply with the iCalendar [4] naming conventions. The predicates are 2-ary, where the first function symbol contains the unique key for the object instance, and the second contains the value for the attribute described. The *Weather* facts has been created by a weather publisher that periodically accesses online weather services to retrieve the latest weather data.

## 2.1 Implementation

Tempus Fugit is a Web based electronic calendar hosted on an application server (see screenshots in Figure 2). The system provides the traditional PIM functionalities, such as calendaring and email, but also has the ability to tie in additional context sensitive information and provide the users with such information "just-in-time". In the current implementation, the system is able to provide company profile information, including recent company news, and attaches such information with scheduled company visits in a calendar. The news items are also sent out via email starting a couple of days before the scheduled event, so that the users can be properly "briefed?about their upcoming visit.

Tempus Fugit also uses rules to send out notifications to meeting attendees at scheduling time, giving attendees the ability to respond to invitations. Other uses of the rules is for performing system administration tasks, for instance deleting expired information or sending out notifications to the administrators reporting user activities. Rule authors can relatively easily implement new features and support new requirements by adding rules or modifying existing rules

## 3. FUTURE DIRECTIONS

An overview has been given of how rules and rule engines can successfully be integrated into a personal information management system or groupware application. There is much to be gained by externalizing parts of the application logic into rules, for instance the possibility of automating tasks that traditionally have been taken care of by agent based technologies. The Tempus Fugit research project is continuing to investigate these technologies, with the goal of one day automating and supporting many of the tedious tasks that people face daily.

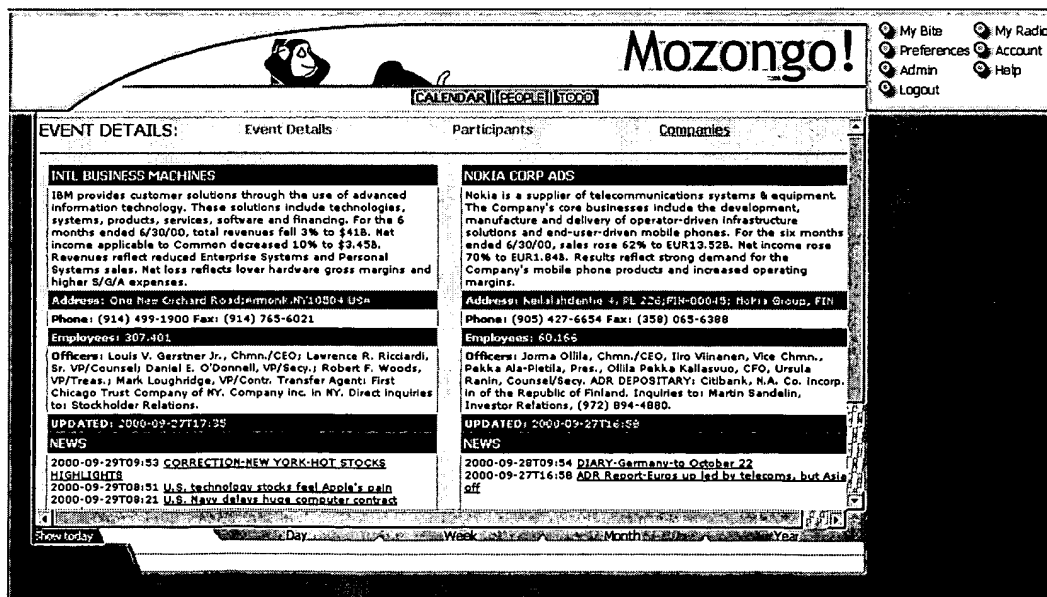


Figure 2. The Tempus Fugit Web calendar. The screenshot shows company profile information associated with a meeting scheduled in a calendar. Mozongo! is the external name of the Tempus Fugit Web site.

## 4. ACKNOWLEDGMENTS

I would like to thank the people in my group who has helped out the project, including Daniel Ford, Joann Ruvolo, Jussi Myllymaki, James Kaufman, Martin Gerlach, Steffen Lassahn, Jared Jackson and Norm Pass.

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1	110	((match\$3 NEAR3 (activit\$3 or event\$1 or interests)) NEAR10 (calendar\$1 or schedul\$3))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/11/20 18:19
2	223	(search\$3 or match\$3 or find\$3) NEAR4 (event\$1 or activit\$3) NEAR4 (interest\$3 or desired or requested)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/11/20 18:22
3	221	((search\$3 or match\$3 or find\$3) NEAR4 (event\$1 or activit\$3) NEAR4 (interest\$3 or desired or requested)) not (((match\$3 NEAR3 (activit\$3 or event\$1 or interests)) NEAR10 (calendar\$1 or schedul\$3)) )	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/11/20 18:22
4	60	((search\$3 or match\$3 or find\$3) NEAR4 (event\$1 or activit\$3) NEAR4 (interest\$3 or desired or requested)) not (((match\$3 NEAR3 (activit\$3 or event\$1 or interests)) NEAR10 (calendar\$1 or schedul\$3)) ) AND (calendar\$1 or schedul\$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/11/20 18:23
5	8	((search\$3 or match\$3 or find\$3) NEAR4 (event\$1 or activit\$3) NEAR4 (interest\$3 or desired or requested)) not (((match\$3 NEAR3 (activit\$3 or event\$1 or interests)) NEAR10 (calendar\$1 or schedul\$3)) ) SAME (calendar\$1 or schedul\$3)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/11/20 18:23